CLAIMS

What is claimed is:

1. An optical communications system comprising:
a transmitter for transmitting an optical signal;
a receiver for detecting said optical signal; and
an optical fiber communications link interposed between said transmitter and said receiver, said optical fiber communications link comprising:
at least one Raman assisted EDFA hybrid amplifier having a Raman amplifier variable gain portion and an EDFA gain portion; and
an optical attenuator coupled to the output of said EDFA gain portion.

2. The system of claim 1 further comprising at least one dispersion-compensation fiber disposed between said Raman amplifier variable gain portion and said EDFA gain portion.

3. The system of claim 1 further comprising at least one dispersion-compensation fiber disposed within said Raman amplifier variable gain portion.

4. The system of claim 1 wherein said EDFA gain portion comprises a multi-stage EDFA.

5. The system of claim 4 further comprising a least one dispersion-compensation fiber disposed between stages of said multi-stage EDFA.

6. The system of claim 1 wherein said optical fiber communication link comprises a plurality of optical fiber spans of varying lengths connected

and arranged between said transmitter and said receiver.

7. The system of claim 1 further comprising a second Raman assisted EDFA hybrid amplifier, wherein said at least one Raman assisted EDFA hybrid amplifier is configured to achieve an optimum launch power for said second Raman assisted EDFA hybrid amplifier.

8. The system of claim 1 wherein said optical fiber communication link comprises a plurality of said Raman assisted EDFA hybrid amplifier.

9. The system of claim 8 wherein said optical attenuator of each said plurality of Raman assisted EDFA hybrid amplifiers is adjusted to reduce the output power of said EDFA gain portion.

10. The system of claim 9 wherein said output power is adjusted in 1 dB increments until optimum power is reached to be launched into the next adjacent Raman assisted EDFA hybrid amplifier.

11. The system of claim 8 wherein said Raman amplifier variable gain portions are manually adjusted until said EDFA gain portions have substantially the same input power throughout said optical fiber communications link.

12. The system of claim 8 wherein said optical attenuator of each said plurality of Raman assisted EDFA hybrid amplifiers is adjusted to reduce the output power of said EDFA gain portion, and wherein said Raman amplifier variable gain

portions are manually adjusted until said EDFA gain portions have substantially the same input power throughout said optical fiber communications link.

13. The system of claim 8 wherein said Raman amplifier variable gain portions are adjusted by way of a feedback loop until said EDFA gain portions have substantially the same input power throughout said optical fiber communications link.

14. The system of claim 8 wherein said optical attenuator of each said plurality of Raman assisted EDFA hybrid amplifiers is adjusted to reduce the output power of said EDFA gain portion, and wherein said Raman amplifier variable gain portions are adjusted by way of a feedback loop until said EDFA gain portions have substantially the same input power throughout said optical fiber communications link.

15. The system of claim 6 wherein said optical fiber span lengths range from about 30 to about 110 km.

16. A Raman assisted EDFA hybrid amplifier comprising:
a Raman amplifier variable gain portion,
an EDFA gain portion; and
an optical attenuator coupled to an output of said EDFA gain portion.

17. The amplifier of claim 16 further comprising at least one dispersion-compensation fiber disposed between said Raman amplifier variable gain portion and said EDFA gain portion.

18. The amplifier of claim 16 further comprising at least one dispersion-compensation fiber disposed within said Raman amplifier variable gain portion.

19. The amplifier of claim 16 wherein said EDFA gain portion comprises a multi-stage EDFA.

20. The amplifier of claim 19 further comprising a least one dispersion-compensation fiber disposed between stages of said multi-stage EDFA.

21. The amplifier of claim 16 wherein said EDFA portion is a single stage EDFA.

22. The amplifier of claim 16 wherein said Raman portion is configured to provide variable gain, whereby said EDFA portion has a substantially constant input power.

23. The amplifier of claim 16 wherein said variable gain ranges from about 1 to 16 dB.

24. The amplifier of claim 16 wherein said optical attenuator reduces output power of said EDFA gain portion.

25. The amplifier of claim 24 wherein said attenuator reduces output power in 1 dB increments.

26. A method of amplifying an optical signal on an optical fiber communications link comprising:
providing a first Raman assisted EDFA hybrid amplifier having a Raman amplifier variable gain portion, an EDFA gain portion, and an optical attenuator coupled to an output of said EDFA gain portion;
transmitting said optical signal on said optical fiber communications link through said Raman assisted EDFA hybrid amplifier;
amplifying said optical signal through said Raman amplifier variable gain portion;
amplifying said optical signal through said EDFA gain portion; and
attenuating output power of said EDFA gain portion.

27. The method of claim 26 further comprising adjusting said optical attenuator to add a predetermined loss of output power of said EDFA gain portion, whereby the launch power is optimized.

28. The method of claim 26 further comprising:
providing a second Raman assisted EDFA hybrid amplifier having a Raman amplifier variable gain portion, an EDFA gain portion, and an optical attenuator coupled to an output of said EDFA gain portion; and
adjusting the Raman gain of said first Raman amplifier variable gain portion, whereby the input power of said second EDFA gain portion is substantially the same as the input power of said first EDFA gain portion.

29. A method of amplifying an optical signal on an optical fiber communications link comprising:

providing a plurality of Raman assisted EDFA hybrid amplifiers, each having a Raman amplifier variable gain portion, an EDFA gain portion, and an optical attenuator coupled to an output of said EDFA gain portion;

transmitting said optical signal on said optical fiber communications link;

amplifying said optical signal through each of said Raman amplifier variable gain portions;

amplifying said optical signal through each of said EDFA gain portions; and

attenuating the output power of said EDFA gain portions to add a predetermined loss to the output of each of said EDFA gain portions, whereby the launch power into the next Raman assisted EDFA hybrid amplifier is optimized and the input power into said EDFA gain portions are substantially the same throughout said fiber communications link.